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**Claudia Meyer,**  
**Program Executive**  
**[claudia.m.meyer@nasa.gov](mailto:claudia.m.meyer@nasa.gov)**

# March 2018

# Space Technology Research Grants *Opportunities to Propose*



**Engage Academia:** tap into **spectrum** of academic researchers, from graduate students to senior faculty members, to examine the theoretical feasibility of ideas and approaches that are critical to making science, space travel, and exploration more effective, affordable, and sustainable.

## NASA Space Technology Research Fellowships

- Graduate student research in space technology; research conducted on campuses and at NASA Centers and not-for-profit R&D labs

## Early Career Faculty

- Focused on supporting outstanding faculty researchers early in their careers as they conduct space technology research of high priority to NASA's Mission Directorates

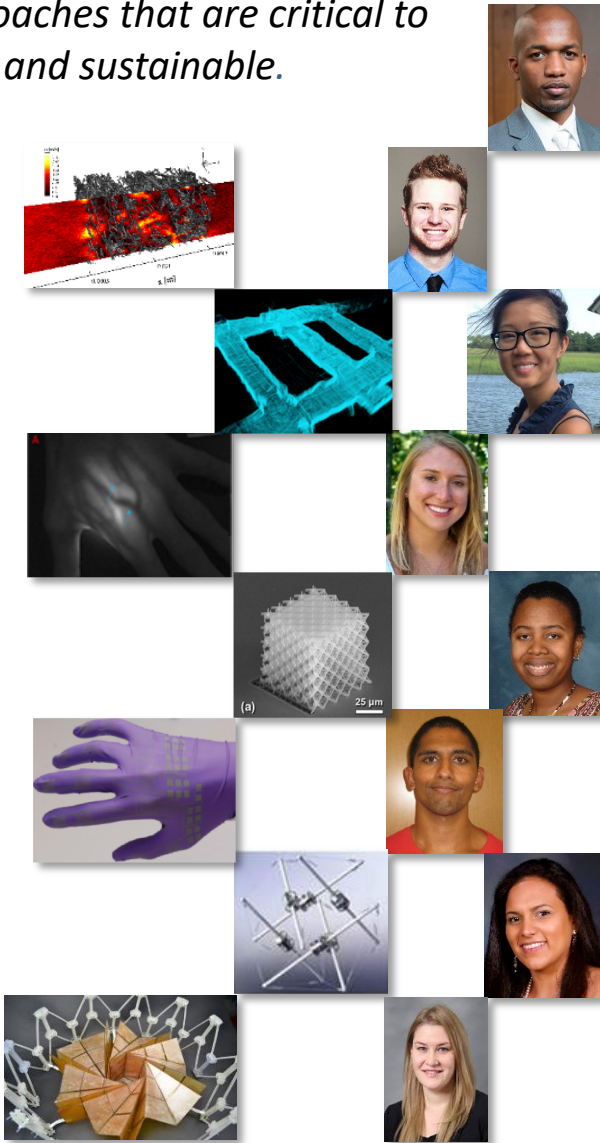
## Early Stage Innovations

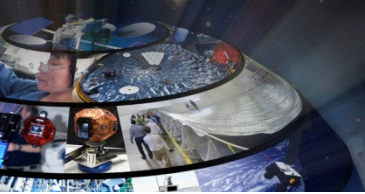
- University-led, possibly multiple investigator, efforts on early-stage space technology research of high priority to NASA's Mission Directorates
- Paid teaming with other universities, industry and non-profits permitted

## Space Technology Research Institutes

- University-led, integrated, multidisciplinary teams focused on high-priority early-stage space technology research for several years

***Accelerate development of groundbreaking  
high-risk/high-payoff low-TRL space technologies***





# STRG Portfolio – Awards To-Date

## Universities



Awards: 539

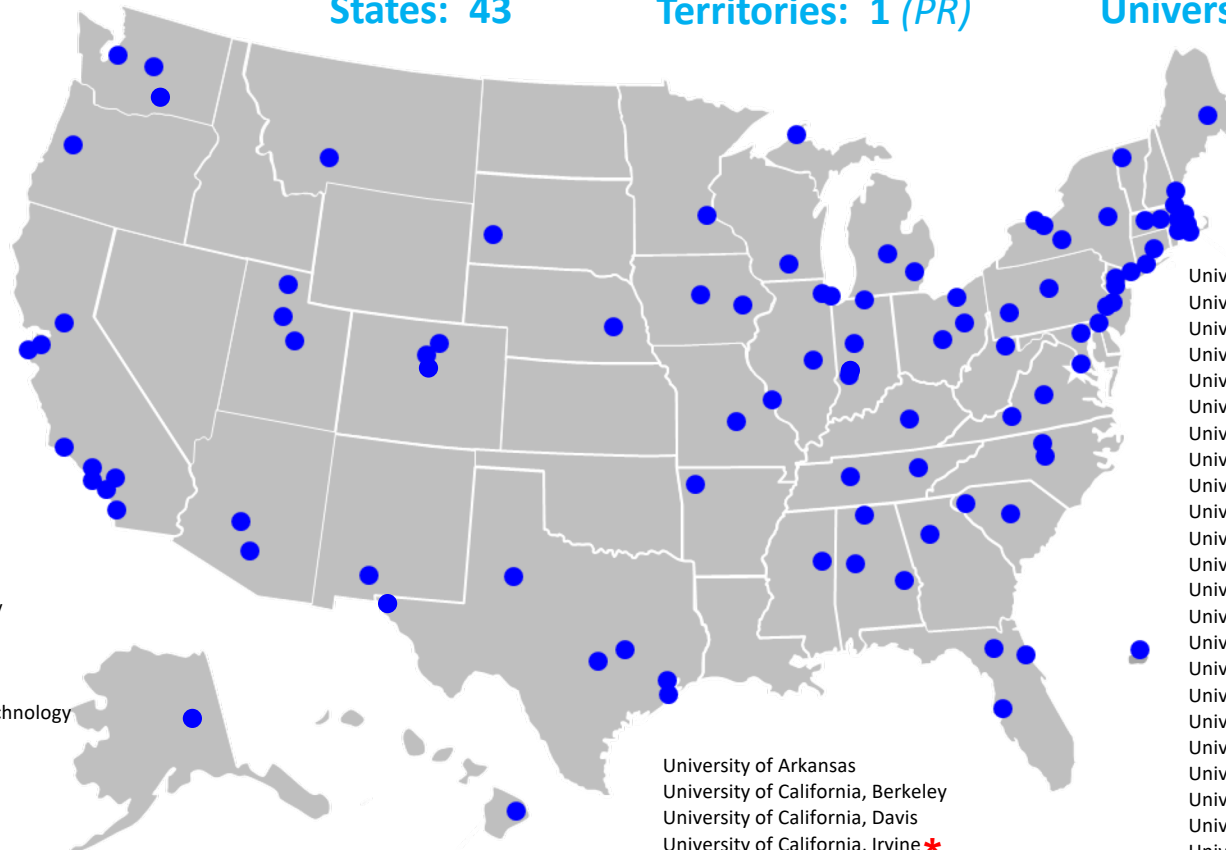
States: 43

Territories: 1 (PR)

Universities: 106

\* Minority serving institution

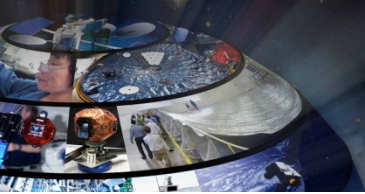
Arizona State University  
Auburn University  
Boston University  
Brigham Young University  
Brown University  
California Institute of Technology  
Carnegie Mellon University  
Case Western Reserve University  
Clemson University  
Colorado State University  
Colorado School of Mines  
Columbia University  
Cornell University  
Duke University  
Florida Institute of Technology  
Georgia Institute of Technology  
Harvard University  
Illinois Institute of Technology  
Iowa State University  
Johns Hopkins University  
Massachusetts Institute of Technology  
Michigan State University  
Michigan Technological University  
Mississippi State University  
Missouri University of Science and Technology  
Montana State University  
New Jersey Institute of Technology  
New Mexico State University \*  
New York University  
North Carolina State University  
Northeastern University  
Northwestern University  
Ohio State University  
Oregon State University  
Pennsylvania State University  
Portland State University  
Princeton University  
Purdue University  
Rensselaer Polytechnic University  
Rochester Institute of Technology  
Rose-Hulman Institute of Technology  
Rutgers University  
South Dakota School of Mines and Technology



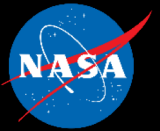
Stanford University  
State University of New York, College of  
Nanoscale Science & Engineering  
State University of New York, Stony Brook  
Texas A&M University  
Texas Tech University  
Tufts University  
University of Akron  
University of Alabama, Huntsville  
University of Alabama, Tuscaloosa  
University of Alaska, Fairbanks  
University of Arizona

University of Arkansas  
University of California, Berkeley  
University of California, Davis  
University of California, Irvine \*  
University of California, Los Angeles  
University of California, San Diego  
University of California, Santa Barbara \*  
University of Central Florida \*  
University of Colorado, Boulder  
University of Connecticut  
University of Delaware  
University of Florida  
University of Hawaii  
University of Houston \*  
University of Illinois, Chicago  
University of Illinois, Urbana-Champaign  
University of Iowa

University of Kentucky  
University of Maine  
University of Maryland  
University of Massachusetts, Amherst  
University of Massachusetts, Lowell  
University of Michigan  
University of Minnesota  
University of Nebraska, Lincoln  
University of New Hampshire  
University of Notre Dame  
University of Pennsylvania  
University of Pittsburgh  
University of Puerto Rico, Rio Piedras \*  
University of Rochester  
University of South Carolina  
University of South Florida  
University of Southern California  
University of Tennessee  
University of Texas, Austin  
University of Texas, El Paso \*  
University of Utah  
University of Vermont  
University of Virginia  
University of Washington  
University of Wisconsin, Madison  
Utah State University \*  
Vanderbilt University  
Virginia Polytechnic Institute & State  
University  
Washington State University  
Washington University, St. Louis  
Western Michigan University  
West Virginia University  
William Marsh Rice University  
Worcester Polytechnic Institute  
Yale University



# STRG Opportunities to Propose *NSTRF*



## Eligibility Requirements for NSTRF18

1. Pursuing or seeking to pursue advanced degrees directly related to space technology.
2. Are U.S. citizens or permanent residents of the U.S.
3. Are or will be enrolled in a full-time master's or doctoral degree program at an accredited U.S. university in fall 2019.
4. Are early in their graduate careers.

NSTRF18: <http://tinyurl.com/NSTRF2018>  
NSTRF17: <http://tinyurl.com/NSTRF2017>  
NSTRF16: <http://tinyurl.com/NSTRF2016>  
NSTRF15: <http://tinyurl.com/NSTRF2015>  
NSTRF14: <http://tinyurl.com/NSTRF14>  
NSTRF13: <http://tinyurl.com/NSTRF13>  
NSTRF12: <http://tinyurl.com/NSTRF12-OCT>  
NSTRF11: <http://tinyurl.com/NSTRF11-OCT>

## Application Components

- |   |                                      |
|---|--------------------------------------|
| 1 Application Cover Page<br>(Program Specific Data Questions) | 5 Curriculum Vitae                   |
| 2 Personal Statement  | 6 Transcripts                        |
| 3 Project Narrative   | 7 GRE General Test Scores            |
| 4 Degree Program<br>Schedule                                  | 8 Three Letters of<br>Recommendation |

## Award Value

Fellowship Budget Category	Max value
Student Stipend	\$36,000
Faculty Advisor Allowance	\$11,000
Visiting Technologist Experience Allowance	\$10,000
Health Insurance Allowance	\$1,000
Tuition and Fees Allowance	\$17,000
<b>TOTAL</b>	<b>\$75,000</b>

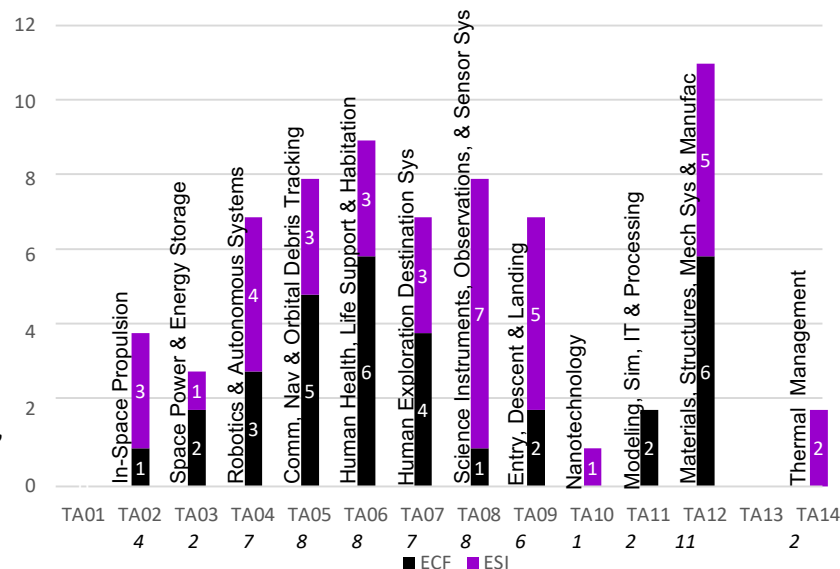
# STRG Opportunities to Propose ECF and ESI



## Technical Characteristics:

- Unique, disruptive or transformational space technologies
- Low TRL
- Specific topics tied to Technology Area Roadmaps and the NRC's review of the roadmaps
- Big impact at the system level: performance, weight, cost, reliability, operational simplicity or other figures of merit associated with space flight hardware or missions

## 66 Topics



<http://tinyurl.com/NASA-14ECF>
<http://tinyurl.com/NASA-15ECF>
<http://tinyurl.com/NASA-16ECF>
<http://tinyurl.com/NASA-17ECF>
<http://tinyurl.com/NASA-18ECF>  
<http://tinyurl.com/NASA-ES113>
<http://tinyurl.com/NASA-14ESI>
<http://tinyurl.com/NASA-15ESI>
<http://tinyurl.com/NASA-16ESI>
<http://tinyurl.com/NASA-17ESI>

## Eligibility Summary:

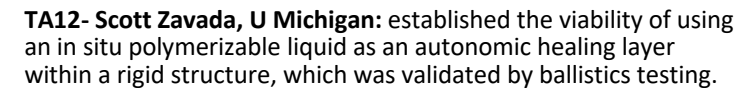
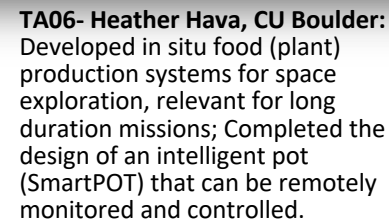
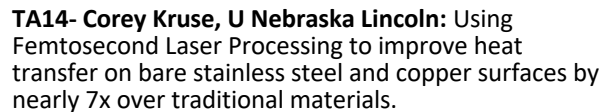
*Both ECF and ESI proposals must be submitted by accredited U.S. universities*

### Early Career Faculty

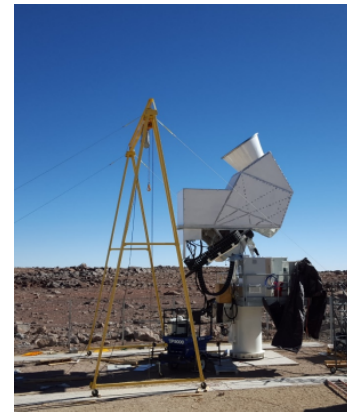
- Untenured assistant professor and on tenure track
- U.S. citizen or permanent resident
- No current or former Presidential Early Career Awards for Scientists and Engineers (PECASE)
- No co-investigators

### Early Stage Innovations

- PI must be from proposing university
- Co-investigators are permitted
- ≥ 50% of the proposed budget must go to the proposing university
- ≥ 70% of the proposed budget must go to universities



**TA04- Jennifer King, Carnegie Mellon:** Successfully expanded the types of tasks that can be performed by robots while reducing the need to hard-code task-specific action sequences. The algorithms use simple physics models (including estimates of friction, mass, etc.) to enable a robot to autonomously plan its interactions with the environment and perform manipulation tasks beyond just pick and place.



**TA08- Kathleen Harrington, Johns Hopkins:** successfully installed and operated Variable-delay Polarization Modulators (VPMs) on the Cosmology Large Angular Scale Surveyor (CLASS) telescope in Atacama, Chile.

Solicitation	Date
NSTRF	4/5/18: NSTRF18 announcement
ECF	2/7/18: ECF18 announcement
ESI	Early May 2018: ESI18 release

Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec															
FYQ4			FYQ1			FYQ2			FYQ3			FYQ4			FYQ1																	
Release			NSTRF												Selection																	
						Release			ECF												Selection											
												Release			ESI												Selection					
(STR1)												Selection			Release			STR1 (released biannually)														

## A globe made of a grid of small images. The images include: a woman in a red shirt, a large blue solar panel, a hand holding a tablet with a graph, a rocket launch, a green field with a rover, a satellite in space, a large white rocket on a launch pad, a robotic arm, a space station, a colorful screen, a satellite dish, a rocket engine, a satellite, a large antenna, a rover on Mars, and a space station. The globe is set against a background of colorful, radiating lines.

# March, 2018

**Jason Derleth**  
Program Executive, NIAC  
[hq-niac@mail.nasa.gov](mailto:hq-niac@mail.nasa.gov)



# What is **NIAC**?

NASA Innovative Advanced Concepts

## *NASA Innovative Advanced Concepts*

A program to support  
early studies of  
innovative, yet credible,  
visionary concepts  
that could one day  
“change the possible”  
in aerospace.



# NIAC Awards, Scope, Criteria

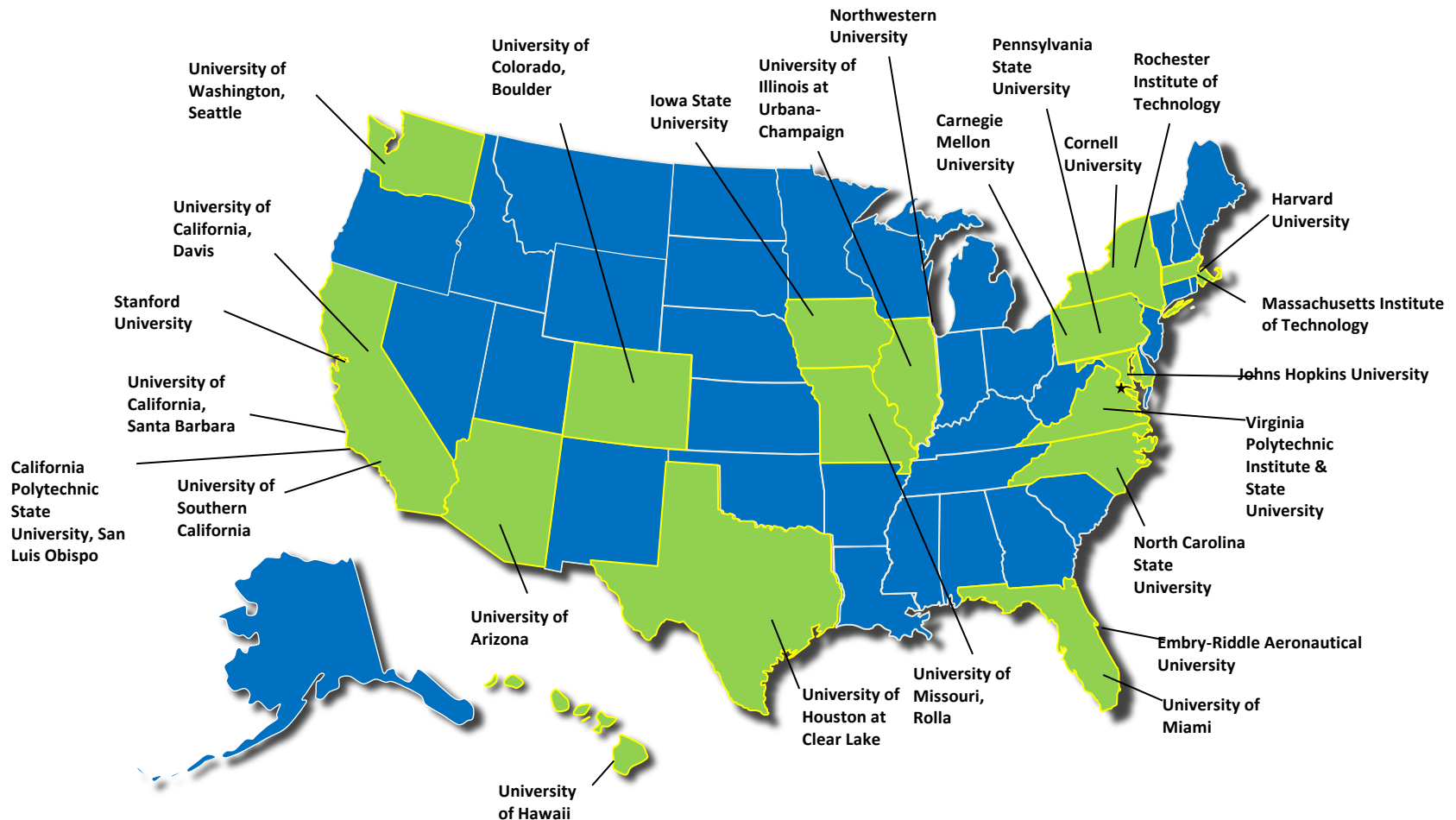


- NIAC grant awards support 2 phases of study:
  - **Phase I:** up to \$125K, ~9 months, for concept definition and initial analysis in a mission context
    - **Proposal Submission & Selection Process:** Two-step Process; Step A is fully- open; Step B by Invitation only; Independent Peer Review. (<https://www.nasa.gov/directorates/spacetech/niac/niac-phase-I-solicitation> )
  - **Phase II:** up to \$500K, 2 years, for further development of most promising Phase I concepts, comparative mission analysis, pathways forward
  - **Eligibility:** All categories of U.S organizations may apply. Non-U.S. organizations may partner in, or lead, NIAC studies on a no-exchange of funds basis, and subject to NASA's policy on foreign participation. **How to Apply:** (<https://www.nasa.gov/feature/how-to-apply-to-niac> )
  - **Goal:** Early studies of visionary aerospace architecture or mission concept
  - **Technology Readiness Level (TRL):** TRL 2 or lower at start of award
  - **NIAC Key Dates:** 2018 Phase I Proposals Due: **19 Sep '17**; Selections: **28 Mar '18**; 2018 Phase II Call for new proposals—Early Dec. 2018 (Planned); (<https://www.nasa.gov/content/key-dates-and-solicitations>)
- Scope of NIAC Phase I Studies:
  - **Aerospace architecture or mission concepts** (not focused tech.)
  - **Exciting:** offering a potential breakthrough or revolutionary improvement
  - **Unexplored:** novel, with basic feasibility and properties unclear
  - **Credible:** sound scientific/engineering basis and plausible implementation
- NIAC proposal evaluation criteria:
  - **Potential of the Concept** (all scope elements above, especially exciting)
  - **Strength of the Approach** (research objectives, technical issues, suitability of team and cost)
  - **Benefits of the Study** (concept definition, mission analysis, wider benefits, scientific/engineering contributions, notably new/different/inspiring)

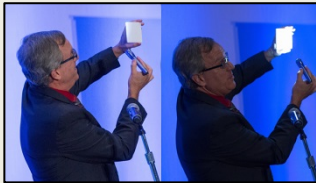
# NIAC Educational Institutions



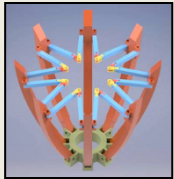
## UNIVERSITY PARTNERS: Inspiring Our Nation's Innovators



# NIAC Awards & Successes



**Robert Youngquist , NASA KSC-** A notable technical paper based on his Phase II study, Cryogenic Selective Surface (Solar White) entitled, "A Cryogenic Deep Space Thermal Control Coating" in the AIAA Journal of Spacecraft and Rockets.

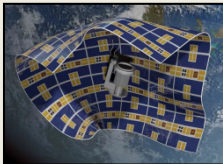


**Prof. Mel Ulmer, Northwestern University-** His magnetic smart materials to build a large in-space telescope received add-on funding of \$450,000 from another government agency. It has the potential to decrease size/cost of space telescopes and correct mirror shape/optics. He produced two notable technical papers related to APERTURE— a precise extremely large reflective telescope using re-configurable elements.

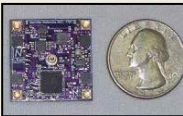
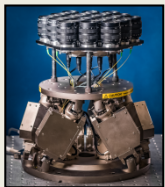
**Stephanie Thomas, Princeton Satellite Systems-** developed an invention, HQN-11484-1 Magnetic Dipole Cancellation for Space Devices Requiring Extremely High Magnetic Fields.



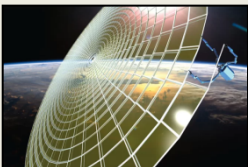
**Prof. Christopher Walker, Univ. Arizona-** a new Arizona company, *FreeFall Aerospace*, has been formed based on his NIAC study, Large Balloon Reflector. FreeFall develops next generation in-space telecom and remote sensing systems. [www.freefallaerospace.com/](http://www.freefallaerospace.com/)



**Siegfried Janson, Aerospace Corporation-** is expanding space counter-collision studies with Brane Craft and developing carbon nanotube technology, radiation hardened photosensors and polymer matrix thin film "muscles" used to flex the spacecraft. Also had a notable article in Aviation Week & Space Technology.



**Prof. Philip Lubin, University of California, Santa Barbara-** was invited to Capitol Hill to meet with members of Congress/staffers. The \$100M private funding created for his NIAC directed energy interstellar concept continues to advance and has notable media coverage in Science, Space.com, Scientific American, and the Discovery Channel. He has lectures about his photonics work nationwide and most recently at The Institute for Energy Efficiency.



**Robert Hoyt, Tethers Unlimited-** won 4 NASA contracts to develop orbital manufacturing and construction technology, a DARPA contract for in-space manufacture of high-throughput SATCOM satellite, selected to build FabLab for ISS and won an Army contract to develop gigabit-class data link for smallsats.

SPIN OFF

OUT OF THIS WORLD



Total reported post-NIAC funding =  
\$133,062,264.00